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THE VETERINARY JOURNAL

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EDITOR:

PROF. SIR FREDERICK HOBDAY, C.M.G., F.R.C.V.S., F.R.S.E.

DR. MED. VET. h.c. (ZURICH),
HONORARY VETERINARY SURGEON TO HIS MAJESTY THE KING,
OFFICIER DU MÉRITE AGRICOLE (FRANCE),
CAVALIERE DEI SS. MAURIZIO E LAZZARO (ITALY),
HONORARY MEMBER OF THE AMERICAN VETERINARY ASSOCIATION,
PRINCIPAL AND DEAN OF THE ROYAL VETERINARY COLLEGE, LONDON.

SUB-EDITOR:

GLADSTONE MAYALL, M.R.C.V.S.

with the collaboration of

E. C. AMOROSO, M.D., D.Sc., PH.D.
RICHARD HUDSON, F.R.C.V.S.
PROF. J. McCUNN, M.R.C.V.S., M.R.C.S., L.R.C.P.
PROF. W. C. MILLER, M.R.C.V.S., F.R.S.E.
LT.-COL. T. DUNLOP YOUNG, O.B.E., D.V.S.M., M.R.C.V.S.

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RICHARD HUDSON
Retford
PROFESSOR J. MCCUNN
Professor of Anatomy, Royal Veterinary College
PROFESSOR W. C. MILLER
Professor of Animal Husbandry and Dietetics, Royal Veterinary College
LIEUTENANT-COLONEL T. DUNLOP YOUNG
Veterinary Adviser to various Overseas Governments; late Chief Veterinary Officer to the Corporation of the City of London

JUNE, 1936

Editorial

HORMONES AND SEX PHYSIOLOGY.

DURING the last ten years one of the most spectacular advances in modern physiological knowledge has been in that section dealing with hormones and sex physiology. Advance has been in fact so rapid that the majority of practitioners, both in the human and the veterinary field, have been unable to keep abreast of the progress made. Under most circumstances there has been what is frequently referred to as a " time lag " between the discovery of a scientific truth and its direct application in practice. A series of different factors, however (chief of which is probably the greater speed with which results become known throughout the scientific world owing to a development of better library services), now combine to cut this " time lag " down to a minimum.

When it is remembered that it was only at the end of the last decade there was published the work of Zondek and Aschheim, which served probably more than any other to focus attention upon and lay the foundation for biological tests for pregnancy, it is remarkable that such development has taken place that to-day there are no less than six different biological tests to which a mare may be submitted, using either blood, serum or urine, on rats, mice, rabbits or capons.

Some of these are favoured by one worker; others by another. No one test by itself can be expected to give 100 per cent. accuracy. It is worth emphasising that " invariability is not a biological phenomenon," and that when using any biological fluid which itself is liable to uncontrollable fluctuations upon living test animals which cannot always be accurately standardised, a certain percentage

of error must be expected. The biological diagnosis of pregnancy, in mares at least, is now reaching the stage at which more full use can be made of it. By an organisation which makes possible the collection of samples of blood and their rapid submission to biological test, a stud in America has been able to obtain six more foals than would otherwise have been possible. There are no scientific reasons why the same should not be possible in Britain, provided owners of mares could be persuaded to overcome the prejudice they have at present against allowing samples of blood to be collected The urine tests for œstrone content have their uses, but numerous workers agree that these tests cannot be expected to compete with blood serum tests for early diagnosis. The two tests are, in effect, complementary, and the time is rapidly approaching when practitioners in horse-breeding districts will be able to perform yet one more service to horse-owners by securing blood samples from mares some 45 days after service, submitting them to test and advising that arrangements should be made to serve this or that mare again ; or that this or that mare is already pregnant.

THE SHORTAGE OF ASSISTANTS.

THE difficulty amongst those whose lives are spent in general practice in regard to the question of obtaining qualified assistance is becoming acute ; and, indeed, for some considerable time the matter has been one to which attention has been drawn by the comparatively large number of applications from practitioners for assistants, and the relatively small number of young graduates who are asking for posts, in the advertisement columns of our weekly contemporary *The Veterinary Record*. Reference to recent issues of this paper show that there are numbers of advertisements from practitioners requiring assistants, in addition to the whole-time positions, and scarcely any young graduates who are asking for posts. For the moment the demand exceeds the supply.

Following so close, too, on the addition of a fifth year of study to the curriculum, with its necessarily added expense, it is somewhat astonishing to the uninitiated that a profession whose chief patient, both in numbers and interest, used to be the horse should still not only exist—but even be considered to be prospering. It speaks well for the adaptability of its members that they have successfully " weathered the storm," and that they have now switched off from consideration of it being necessary to settle down in practice in the districts where horses can be found, to recognise that the cow and the dog each are of such national importance as to be required to be kept free from epidemics. That these animals are of growing importance is self-evident, if for no further reason than that they can " pass on " diseases which are known to be communicable from animals to man.

It is largely for this reason that the source of the present shortage originates, as the harnessing up of the two branches of medicine—the human and the veterinary—in the cause of Public Health has brought into prominence the fact that the communicable diseases are of sufficient danger to merit close collaboration ; and this has resulted in the formation of a Veterinary Health Service with its necessary staff of qualified veterinarians, and has thus given us another outlet for our young graduates.

General Articles

MINERAL DEFICIENCY DISEASES IN FARM ANIMALS*

By J. RUSSELL GREIG, Ph.D., M.R.C.V.S.,

Director Moredun Institute, Animal Diseases Research Association, Edinburgh.

In dealing with the subject from the clinical and therapeutic aspects, Dr. Russell Greig confined himself to two disease conditions, one of which, pine, represented an insufficient intake of an essential mineral, iron, while the other, milk-fever, represented a failure on the part of the animal economy to mobilise and metabolise an essential mineral, in this case calcium.

He stated that the disease of sheep and young cattle known as "pine," has been recognised in this country for at least a century. The condition is characterised by emaciation, lethargy and inco-ordination of gait, and usually terminates fatally.

Conditions of progressive anæmia and debility similar to the Scottish form of pine have also been observed in countries other than Scotland: in New Zealand there is a disease known as "bush sickness"; in Kenya, a similar condition known as "Nakuruitis" occurs, while in Florida the disease known as "salt sick" also presents many characters in common with those of Scottish pine. The attention of the Moredun Institute was drawn to the acute condition of pine which occurs in the island of Tiree. This island, one of the Inner Hebrides, is 34 square miles in extent, treeless, low and flat; it consists of three clearly contrasted types of terrain. These are: (1) raised beach; (2) blown sand; (3) rock with little or no soil. A preliminary survey of the island quickly showed that the disease was confined to those areas which consist of a very shallow soil superimposed upon the blown sand, and it had long been recognised by the islanders that, if cattle in the early stages of pine were moved to the raised beach areas, the disease quickly disappeared, and also that it could be prevented by periodically shifting the animals from the blown sand to the raised beach areas; but, if the animals were continuously grazed on the blown sand area, pine might develop in as short a period as three or four weeks, although more commonly the symptoms became manifest only after the animals had been grazed continuously on the affected pasture for a period of two to three months.

The symptoms of "pine," as it occurs in Tiree, are those of a progressive debility, accompanied by anæmia and emaciation. The onset is frequently insidious. The affected animal is dull, and the coat, in the case of cattle, is rough and staring; the visible mucous membranes, especially the conjunctiva, become

* Summary of Lecture delivered at the Royal Veterinary College, London, May 18th, 1936, under the auspices of the University of London.

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pale ; physical condition is gradually lost, the eyeball becomes sunken, and there is commonly a serous discharge from the eye. In young animals growth is markedly retarded and they soon present a stunted, unthrifty appearance. The anæmia and emaciation progress, and, finally, as the result of extreme weakness, the animal is unable to rise. In severe cases the gait is stilted and somewhat inco-ordinated.

Since the clinical symptoms of pine, in Tiree, presented a marked similarity to those of bush sickness and Nakuruitis, and since these diseases had been shown to respond to the administration of iron, controlled field experiments were set up with the collaboration of the Rowett Research Institute and the Macauley Institute for Soil Research, and, as a result, it was found that the administration of iron was effective both in curing and in preventing pine.

Further investigations have shown that similar forms of pine occur in several areas on the mainland of Scotland and that in these iron exerts a specific curative and preventive action.

Dr. Russell Greig then indicated the steps which led up to the hypocalcæmia hypothesis on the ætiology of milk fever, which he and Dr. Dryerre had evolved, and its subsequent experimental confirmation in so far that it had been shown that an acute hypocalcæmia represented the immediate cause of the milk fever attack. The modern conceptions of the pathogenesis of milk fever were discussed, and he described the early experiments to determine whether the disease could be cured by the injection of assimilable calcium salts and the steps which led up to the evolution of the specific curative treatment by calcium boro-gluconate.

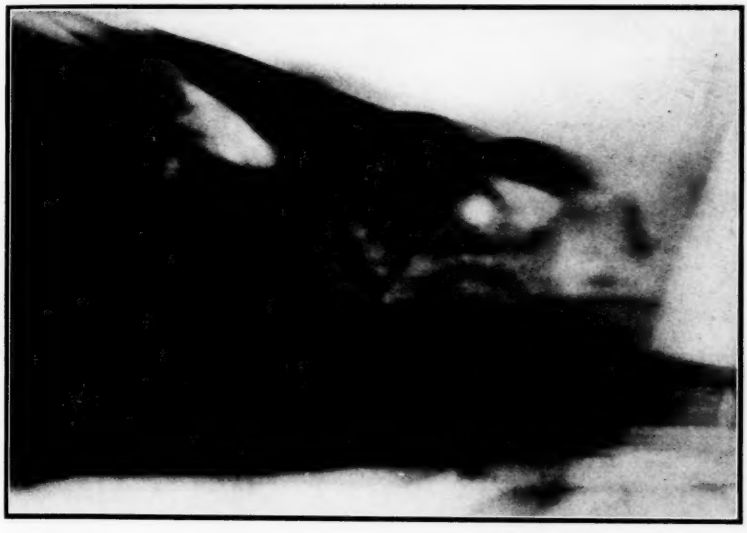
THE BIOLOGICAL DIAGNOSIS OF PREGNANCY IN ANIMALS.

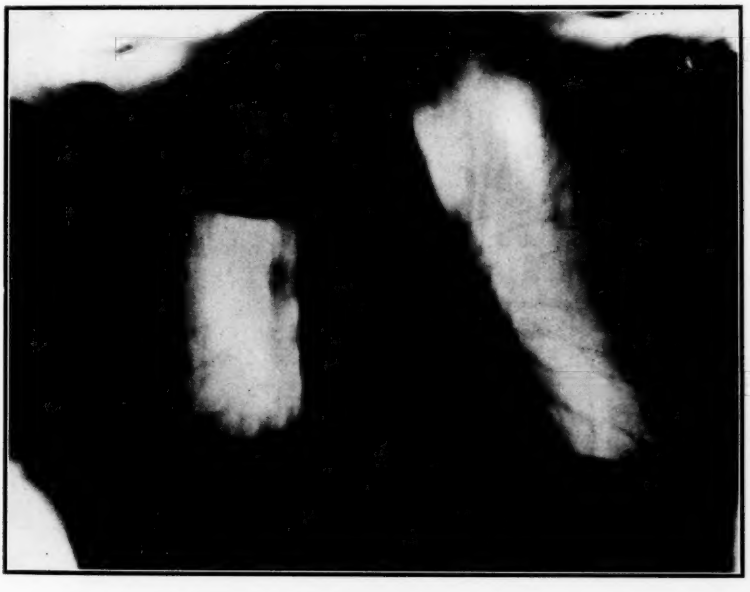
By JAMES ANDERSON, B.Sc., M.R.C.V.S.
Experimental Station, Division of Veterinary Research, Kenya Colony.

IT is now about five years since biological methods for the diagnosis of pregnancy in the mare were introduced. During this period a considerable amount of information on the subject has accumulated and the investigations have been extended to other animals. Sufficient time has now elapsed to give the various methods employed an adequate trial ; to compare the different techniques ; to assess the results, and to investigate more fully errors that have arisen. Two methods are now in use : (*a*) which is based on the presence of gonad-stimulating hormone in blood serum, and (*b*) which depends on the demonstration of œstrone in the urine.

Hormonal Basis of the Biological Methods.

Mare.—(i) *Serum Test.*—It has been shown that the gonad-stimulating effect of blood serum of pregnant mares commences on the 37th day of pregnancy, and from about the 42nd day until the 80th day the effect is maximal, after which it gradually declines until the 180th day (Cole and Hart, 1930, *a*, *b*). Zondek (1930) noted that the amount of this hormone in the blood of the pregnant mare





Mineral Deficiency Diseases in Farm Animals.

(*Article by* J. Russell Greig, Ph.D., M.R.C.V.S., *page* 199)

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up to the 100th day of pregnancy was about the same as in pregnant women, namely 4,000 r.u. per litre. Sera from mares in later stages of pregnancy give slighter reactions, and when taken from mares in the latest stages of pregnancy, none at all. The presence of anterior pituitary hormone in the blood therefore permits the determination of pregnancy of six to seven weeks' duration in the mare, and the method is applicable up to about the 100th day of pregnancy.

(ii) *Urine Test.*—This test depends on the excretion of œstrone in the urine. The luteinisation hormone of the anterior pituitary occurs in the blood of the pregnant mare, as already stated, but not in the urine, in contradistinction to woman, in whom its presence in the urine is utilised for the well-known Aschheim-Zondek pregnancy test. The author has carried out numerous tests for this hormone at various stages of pregnancy, as have other workers, and it is now fully established that it is not present in the urine of the pregnant mare in readily detectable amounts. Zondek (1930) published an account of a method for the diagnosis of pregnancy in the mare by the demonstration of œstrone and ovulation-stimulating hormone in the urine. The author carried out comparable tests with specimens of urine, collected from pregnant mares from the 35th to 50th day of pregnancy in immature and ovariectomised female mice, and was unable to find any difference in the degree of the response or in the period of time at which it became effective. It was, therefore, concluded that if the ovulation-stimulating hormone does occur in the urine in early pregnancy its concentration there is very small, and that it is of no importance for the diagnosis of equine pregnancy.

Excretion of Œstrone in the Urine of the Pregnant Mare.

The earliest stage of pregnancy at which œstrone has been detected in the urine by the author is the 39th day, when 830 m.u. per litre of urine was found. From this period onwards its concentration in the urine increases steadily, reaching a maximum towards the end of pregnancy. The following table gives the maximum amounts of œstrone found in the urine at the particular stages of pregnancy indicated.

Period of Pregnancy in days.	No. of m.u. per litre of urine.
39	830
48	1,600
65	2,400
82	2,500
95	3,300
104	4,100
130	25,000
162	41,000
165	111,000
187	166,000
248	222,000

Glud, Pedersen-Bjergaard and Portman (1933) state that the largest amount of œstrone—225,000 m.u. per litre—was found on the 136th day. Shtamler and

Faiermark (1932) give the œstrone content of the urine at four months as 100,000 to 150,000 m.u. and at 5 to 6 months as 400,000 to 800,000 m.u.

There is, however, considerable individual variation in the excretion of this hormone in the urine. In one mare no hormone could be detected on the 43rd day of pregnancy, and it was not until the 47th day that it was found in a concentration of 830 m.u. per litre of urine. In five other mares the concentrations were 830, 600, 830, 830 and 830 m.u. per litre of urine on the 65th, 73rd, 79th, 80th and 92nd days respectively. In no other case, so far observed, has the concentration (830 m.u.) at the 92nd day of pregnancy been so small. On the other hand, one mare has shown a concentration of 1,600 m.u. of œstrone per litre of urine as early as the 48th day. Generally, in the majority of pregnant mares, the concentration of 1,000 m.u. is not exceeded until about the 60th to 65th day of pregnancy.

Excretion of Œstrone in the Urine of the Non-pregnant Mare.

Since the presence of œstrone in the urine is not specific for pregnancy, it is necessary to consider under what conditions, other than those of pregnancy, and in what concentration it occurs in the non-pregnant mare.

(i) *During the œstrous cycle.*—Observations on this point have been made on only three mares—two Shetland ponies and one Clydesdale, comprising six heat periods. No hormone was detected in the urine of the Shetland pony mares at any stage of the cycle. The Clydesdale mare came on heat on the 2nd June, 1931. She was served on the 5th June, and on that day a concentration of 330 m.u. œstrone per litre of urine was found. Two specimens were collected on the 6th June, the first at 12 noon and the second at 8.30 p.m. The former contained 160 m.u. and the latter 550 m.u. per litre of urine. On the 7th June the concentration was 160 m.u. Specimens collected for some days previously to the 2nd June also showed a concentration of 160 m.u. Kust (1931, *a*) has reported that, up to 1,000 m.u. of œstrone per litre of urine may be found during œstrus. These findings suggest that during diœstrus the excretion of œstrone in the urine of the mare amounts to approximately 160 m.u. and that during œstrus approximately 800 m.u. may be found.

(ii) *Excretion of Œstrone in the Urine of Non-pregnant Mares which do not show signs of Heat.*—Several instances of an excretion of from 300 to 800 m.u. of œstrone in the urine of non-pregnant mares which showed no signs of heat, have occurred. The first instance was a Shetland pony mare which was going off heat on 29th April, 1931, when tested by the stallion. Nine specimens of urine from this mare up to the 25th June were all negative. On the 30th June and 4th July, 830 m.u. were found when the mare was not on heat. On the 7th July no hormone was detected, but on the 9th, 830 m.u. of œstrone were detected, but the mare still showed no signs of heat. The interesting point about this mare is that the excretion of œstrone occurred approximately one month after she was last known to have been on heat, and at this period may have been experiencing what is known as "silent" heat. The second instance was a Clydesdale mare which foaled on 25th April, 1931. From the 2nd day until the 13th after foaling no hormone was

detected in her urine. On the 14th day 800 m.u. were found and from then until the 25th day after foaling amounts of 300 to 800 m.u. were found regularly. Three specimens were examined on the 24th day: (*a*) collected at 12 noon showed a concentration of 830 m.u.; (*b*) collected at 5 p.m., 160 m.u.; and (*c*) collected at 8.30 p.m., 160 m.u. A specimen collected at 5 p.m. on the 25th day showed 550 m.u. During this period, from the 14th to the 25th day after foaling, the mare showed no signs of being on heat. From the 26th to the 39th day after foaling, when she came on heat, amounts of 160 m.u. œstrone were found.

In some instances a mare may be served and may not come on heat again, and is consequently thought to be in foal. Three instances of this nature have occurred, 154, 178 and 179 days after service respectively. Specimens of urine from each mare all showed a concentration of 830 m.u. of œstrone per litre of urine, but failed to show the concentration of œstrone which should normally have occurred at this stage had the mares been pregnant. A diagnosis that these mares were non-pregnant was subsequently proved to be correct.

The Excretion of Œstrone in the Urine in Pathological Conditions.—Specimens of urine from three nymphomaniac mares have been examined by the author. The mares were all showing more or less continuous signs of œstrus. No hormone was detected in one specimen. The other two specimens gave a concentration of 330 and 830 m.u. of œstrone per litre of urine respectively. Miller (1935) has noted an excretion of 3,000 m.u. in mares with cystic ovaries. Kust (1931, *a*) was unable to detect any hormone in the urine of nymphomaniac mares.

The Diagnosis of Equine Pregnancy by the Demonstration of Œstrone in the Urine.—It is apparent from what has been said that œstrone is excreted in the urine of the mare, not only during pregnancy, but also, under certain other conditions, in the non-pregnant animal. It accordingly becomes necessary that any method for the diagnosis of pregnancy, based on the excretion of œstrone must be a quantitative one (Crew, Miller and Anderson, 1931). This fact has been recognised by Kust, who diagnoses a pregnancy of 42 days' duration if there is more than 1,000 m.u. present in the urine, and a pregnancy of 70 days' duration if the concentration exceeds 2,000 m.u. The essential point is that the concentration of œstrone must exceed that found in the non-pregnant animal before a diagnosis can be made. The highest concentration found by the author in the non-pregnant mare, under any condition, has not exceeded 830 m.u. No mare is, therefore, diagnosed as pregnant unless 1,000 m.u. per litre of urine are found, and for practical purposes the diagnostic concentration in the early stages of pregnancy is taken as 1,100 m.u. The earliest stage of pregnancy at which a diagnosis of pregnancy has been made is the 48th day after conception, although in one mare a diagnosis was not possible until nearly the 100th day of pregnancy. Usually, however, a diagnosis can be made about the 60th to the 65th day.

Cow.

Several workers have failed to demonstrate the presence of anterior pituitary hormone in either the blood or urine of pregnant cows (Kust, 1931, *b*; Remlinger

and Bailly, 1934; Chaivovsky and Bondarenko, 1933; Witzsch, 1933). Numerous investigations with both blood and urine from pregnant cows have been made by the author with negative results in all cases. Papi (1933) and Morine (1934) claim that the intravenous injection of pregnancy urine into the rabbit caused enlargement and hæmorrhage of the ovaries. On the other hand, Menzani and Gentile (1934) state that only two out of 29 pregnant cows gave positive ovarian responses, on the 32nd and 37th day of pregnancy, and these authors conclude that the specific hormones are not secreted constantly or in any case cannot be demonstrated in the rabbit. It thus seems to be clearly established that gonadotropic hormones of the anterior pituitary are either absent from or are present in amounts that cannot readily be detected in the blood and urine of the pregnant cow.

On the other hand, numerous workers have demonstrated the presence of œstrone in the urine of the pregnant cow (Lipschutz and Veshnajokov, 1930; Turner and co-workers, 1930; Hisaw and Meyer, 1929; Anderson, 1934). Compared with the mare the concentration of œstrone in the urine of the pregnant cow is small. The following table shows the amounts found at different stages of pregnancy in the cow (Anderson, 1934).

Period of Pregnancy in days.	No. of m.u. per litre of Urine.
Conception to 78th day.	Less than 33.
79—100	33
101—150	440
151—200	550
201—250	830
251—parturition	1,100

Considerable variation occurred in the concentration of the hormone in the urine of all cows examined. Witzsch (1933) states that œstrone could not be found up to the 151st day of pregnancy, but from the 186th day it was easily detected.

It is thus apparent that the biological diagnosis of pregnancy in the cow is not yet feasible. It is in the early stages of pregnancy that a biological diagnosis of pregnancy is most useful. In the cow œstrone is not excreted in the urine in readily detectable amounts until comparatively late in pregnancy and by this time a clinical diagnosis can be made.

Other Animals.

So far, anterior pituitary hormones have been found in the blood and urine of pregnant women and in the blood of the pregnant mare. It has not been detected in either the blood or urine of the pregnant sheep (Erhardt and Ruhl, 1933; Addis, 1933; Kust and Vogt, 1934, *a*). Maurer (1934) and Kust (1934) obtained negative results using urine.

No anterior pituitary hormone has been detected in the blood or urine of the pregnant sow (Kust and Struck, 1934). These authors found that in the pregnant sow there was transitory excretion of fairly high concentration of œstrone in the urine from the 23rd to the 30th day. From the 5th to the 11th week of pregnancy

no hormone could be detected in the urine, but commencing with the 11th week the concentration of the hormone increased to more than 4,000 m.u. before parturition. It is concluded that examination of urine for sex hormones is not likely to be of great use for the diagnosis of pregnancy in this animal.

Erhardt and Ruhl (1933) were unable to detect anterior pituitary hormone in the blood or urine of dogs and cats. Helm (1931) failed to find any œstrone in the urine of 28 pregnant bitches, and Kust (1931, *b*) was unable to find either anterior pituitary hormone or œstrone in the blood or urine of pregnant bitches.

In the goat, Maurer's experiments with urine, using infantile mice as test animals, gave negative results. In this animal Erhardt and Ruhl (1933) failed to find any anterior pituitary hormone in either the blood or urine and Remlinger and Bailly (1934, *a*) failed to find any anterior pituitary hormone in the urine of two pregnant goats. Kust and Vogt (1934, *b*) were unable to demonstrate œstrone in the urine of the goat until pregnancy was well advanced, by which time it could be diagnosed clinically.

Experiments with the serum of one guinea-pig and one rabbit doe (Remlinger and Bailly, 1934, *a*) and the blood and urine of rodents (Erhardt and Ruhl, 1933) failed to show the presence of anterior pituitary hormone. Twenty-seven tests on female elephants failed to show any reaction for either gonadotropic anterior pituitary hormone or œstrone (Miller, 1934).

It is thus apparent that the biological diagnosis of pregnancy is at present practicable only in the mare.

Technique.

Serum Test.—This test is similar to that of Aschheim-Zondek for the diagnosis of human pregnancy. Either mice or rabbits are used as test animals: (i) Four or five infantile female mice receive injections of from 0.2 ml. to 0.5 ml. of serum twice daily for three days. On the morning of the 5th day the mice are killed and the ovaries examined. The presence of hæmorrhagic spots and corpora lutea is taken as evidence of the existence of pregnancy; (ii) Magnusson (1934) has investigated the rapid method of Friedmann and Schneider, using the rabbit as the test animal. Fifteen ml. of blood serum is injected intravenously, and the ovaries are examined after 24 to 48 hours. The rabbits used should weigh not less than 1,400 grams, and should be kept isolated for a suitable period prior to injection to obviate the risk of spontaneous ovulation. Diagnosis is made on the occurrence of ovulation. Catchpole (1934) uses a single injection of 10 ml. serum intravenously into the rat and makes a diagnosis on the occurrence of hæmorrhagic follicles and corpora lutea.

Urine Test.—Ovariectomised mice are used. They should not be inoculated with pregnancy urine for at least one week after removal of the ovaries. Such mice can be used for a number of tests, but at least a week should elapse after a previous test before they are used again. Prior to injection the urine is treated with sulpho-salyclic acid. This substance is added to the urine until effervescence ceases or in amounts of approximately 1 gram per 25 ml. of urine, whichever is

the greater. The effect of the sulpho-salyclic acid is to precipitate any protein present and to detoxicate the urine. The specimen of urine is then shaken, allowed to stand for a few minutes, filtered and neutralised with sodium bicarbonate, using B.D.H. Universal Indicator. Originally the urine was allowed to stand for 30 minutes after addition of the sulpho-salyclic acid, but five minutes has been found to be equally effective. The mortality in mice from urine treated in this manner is much less than 1 per cent.

Originally the urine was diluted prior to injection with appropriate amounts of normal saline in order to estimate the concentration of the hormone (Crew, Miller and Anderson, 1931). Now, distilled water is used. The procedure now adopted is as follows: five mice are used, and the amounts and dilution of urine employed is given in the following table:—

Mouse.	Dilution of Urine.	Dosage of Urine.	Total amount normal Urine injected.
1	1 : 1	0.2 ml. x 6	0.6 ml.
2	1 : 1	0.25 ml. x 6	0.75 ml.
3	1 : 1	0.3 ml. x 6	0.9 ml.
4	N	0.2 ml. x 6	1.2 ml.
5	N	0.5 ml. x 6	3.0 ml.

The above injections are given twice daily, and vaginal smears are made on the morning of the 5th day, are fixed in methyl alcohol and stained with Giemsa. Complete cornification of the vaginal cell contents is regarded as a positive result. With the above doses the concentration of œstrone per litre of urine is from approximately 300 m.u. to 1,660 m.u. No. 3 mouse is the critical one, and this mouse must show complete cornification for a positive diagnosis, in addition to mice Nos. 4 and 5. Usually some indication of œstral activity will also be noticed in mice Nos. 1 and 2. All specimens of urine collected in the first 90 days of pregnancy receive the above doses and dilutions of urine. If any specimen of urine gives a positive result with the smallest amount of urine, further dilution is usually carried out to demonstrate the approximate concentration of œstrone present. After about the 100th day of pregnancy, dilutions are made to show the concentration of œstrone that would normally occur if the animal were pregnant. At the 200th day, for example, a positive result should be obtained with a 1 to 200 dilution. The number of mice can be reduced to four for testing specimens taken later than the 100th day of pregnancy. Three mice receive diluted urine and one undiluted urine in case there should only be a very small amount of hormone present. For a positive diagnosis, two of the three mice receiving diluted urine should show complete cornification as well as the one receiving undiluted urine.

Results.

The earliest time at which a positive diagnosis is possible with the serum test is 37 to 42 days after conception (Cole and Hart, 1931). Erhardt and Ruhl (1933) in an examination of 25 mares gave the earliest date as the 45th day. The earliest times given by other workers are: Schaper (1933), about the 40th day; Karmann and Wiethoff (1933), 43rd to 51st day; and Grini (1935), the 41st day.

It has already been noted that the serum method can only be used up to about the 100th day of pregnancy. Thereafter the hormone content of the blood decreases and negative results from pregnant mares are likely to arise. Shtamler, Shukhgalter and Faiermark (1933) therefore recommend diagnosis from urine after the 106th day. Kust (1933) states that blood can be used up to the 150th day.

This test has given fairly good results in the hands of different workers. Shtamler, Shukhgalter and Faiermark (1933) tested 116 mares; 143 tests were made between the 40th and the 106th day of pregnancy with four errors; from the 107th to 219th day, two negative diagnoses out of 18 were incorrect. Schaper (1933) has also noted that during the more advanced stages of pregnancy the serum test does not give accurate results. Erhardt and Ruhl (1933) noted three errors in 25 blood tests, all of which, however, were with specimens collected before the 40th day. Martenssen (1934) tested 50 mares between the 47th and 67th day after service with a correct result in all cases. Magnusson (1934) had an error of 1.3% in 140 pregnant mares between 6 and 15 weeks, and an error of 2% in 149 non-pregnant mares. In 112 tests on pregnant and non-pregnant mares, Karmann (1934) had five errors. Catchpole (1934) has examined the value of the blood test on a stud farm. Mares were bled routinely from the 42nd to the 45th day. Of 44 such mares 30 gave a positive result and 14 were negative. Nine mares were re-mated and six subsequently gave a positive result.

Urine Test.—The earliest date on which the author has been able to give a positive diagnosis, *i.e.*, a diagnosis based on finding more than 1,000 m.u. œstrone per litre of urine, is the 48th day of pregnancy. Usually a diagnosis cannot be given until about the 60th to the 65th day, and in one case it was delayed until nearly the 100th day. In some cases reported by other workers it appears that a diagnosis is made on the first appearance of œstrone in the urine, which undoubtedly occurs at an earlier date than the diagnostic concentration recognised by the author. Kust (1931) has noted the necessity for a quantitative estimation of the hormone and gives a positive diagnosis when six weeks after mating the concentration is more than 1,000 m.u., and after 10 weeks more than 2,000 m.u. He has been able to diagnose pregnancy in some 1,000 mares by this method in 97% of cases from the 8th week. Miller (1934) records an accuracy of 99% for 648 mares and states (1935) that while most pregnant mares could be expected to give positive results by the 60th to the 65th day, some may give a good positive result by the 30th day; on the other hand, in one case it was not until the 100th day that a good positive result was obtained. The author has carried out 438 estimations on 148 pregnant and non-pregnant mares with an accuracy of over 99%. Shtamler and Faiermark (1932), who examined the urine of 26 mares, state that pregnancy may be diagnosed for 5,000 m.u. at the end of the 2nd month; for 10,000 m.u. at $2\frac{1}{2}$ to 3 months with an accuracy of 100%; for 20,000 m.u. at $3\frac{1}{2}$ months and at 4 months for 100,000 m.u. Schaper (1933) has examined 252 mares. He states that diagnosis was correct in all cases for the 2nd and 3rd parts of pregnancy, with one exception, but for the 1st part results were doubtful.

Discussion.

It is apparent that a consistently earlier result can be obtained with blood than with urine. The gonadotropic hormone appears in the blood at a definite interval after successful service. At the most there is a variation of a few days in the time of its appearance, whereas there is considerable variation in the time of the first appearance of œstrone in the urine of different mares, and as regards the occurrence of the diagnostic concentration of œstrone there may be as much as three weeks or more difference in different mares. When a diagnosis is particularly required earlier than 60 days after conception, and when the services of a veterinarian are readily available for the collection of a specimen of blood, the blood test offers definite advantages. On the other hand, although the urine test does not permit of such an early diagnosis, a negative result 60 days after service still enables the mare to be examined and re-mated without missing a breeding season, while a positive result can also be obtained sufficiently early to allow of definite steps being taken for the management of the brood mare.

Kust and Zumbaum (1931) examined 40 specimens of blood and urine from 36 mares. In 17 pregnant and 22 non-pregnant mares both blood and urine tests gave identical results. In one case only, in which the blood test was positive and the urine test negative, was there disagreement. The stage of pregnancy at which this particular result was obtained is not stated, but it would appear probable that it was carried out in the early stages before œstrone appeared in the urine. Karmann (1934) carried out 56 blood tests and 15 urine tests on 71 pregnant mares and 56 blood tests and 20 urine tests on 76 non-pregnant mares. The diagnosis from the urine was correct in all instances, but there were five errors with the 112 blood tests ; two non-pregnant mares gave a positive result and three pregnant mares negative results. Here also, it is not clear at what stage of pregnancy these erroneous results were obtained, but the author refers briefly to the presence of small amounts of œstrone in the blood from the 50th to the 150th day, and increased amounts in non-pregnant mares as possible causes of error.

With regard to the blood tests, comparisons have been made between the use of rodents and the rabbit as test animals. The result of the test in the rabbit (Friedmann-Schneider method) is known after 24 to 48 hours, which at the most is only half the time required with rats and mice. Provided rabbits weighing not less than 1,400 grams are used, results only slightly less accurate than those of the mouse test are obtained (Magnusson, 1934). Stalfords and Hoflund (1934) found that this method gave identical results with the mouse test. A diagnosis can also be obtained from urine in 48 hours, the method depending on pigmentary changes in the growing feathers of Brown Leghorn capons caused by the presence of large amounts of œstrone in the urine (Greenwood and Blyth, 1934).

The mouse is the usual test animal for the urine test, but in some instances, mainly on account of the toxicity of the urine, the rat has been used. The mouse is the better animal, however. It occupies less space than the rat and permits the recognition of smaller amounts of œstrone, for it is known that the rat unit

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is two to four or eight times as great as the mouse unit (Allen and Doisy, 1927; Bugbee and Simond, 1926). In a series of 52 mares the earliest positive result was obtained on the 41st day of pregnancy in mice, and in rats on the 45th day. Rats and mice showed no difference with regard to toxicity when injected with untreated urine (Kust and Zumbaum, 1932).

It is apparent from a perusal of the literature that some difficulty has been experienced due to toxicity of the urine. Zondek (1930) reported that he was able to lessen this toxicity by treating the urine with ether. This has not been confirmed by Kust and Zumbaum (1932). In a series of experiments there was greater mortality in the ether-treated urine than with the untreated urine. This treatment, however, reduced the mortality in rats. These workers conclude that specimens of urine for test should be as fresh as possible. It appears to be quite clearly established that treatment of urine with sulpho-salyclic acid, as already described, possesses very definite advantages over other methods. The mortality in mice injected with urine treated in this way is practically nil. Moreover, urine may be weeks old, as was the case with specimens from India before being tested, but with this sulpho-salyclic acid treatment the mortality was no greater than with fresh urine.

Zondek (1930) claimed that treatment of urine with ether augmented its hormone content. On the other hand, very large quantities of hormone can be readily detected without such treatment. Kust and Zumbaum (1932) failed to confirm this augmentation effect of ether and noted that in most cases there was actually a decrease in hormone content after such treatment.

Zondek stated that his diagnostic method was based on the presence of Prolan A and œstrone in the urine, and accordingly used infantile white mice in order that the effect of Prolan A on the ovaries might be evident. The presence of Prolan A in the urine of the pregnant mare has not been clearly demonstrated, and for the purposes of pregnancy diagnosis the author believes it to be of no value. There is, therefore, no object in using infantile mice. Ovariectomised mice have the added advantage that they can be used repeatedly for testing specimens of urine. The best estimation of how many times a mouse may be used is probably the physical condition of the mouse. Bugbee and Simond (1926) found that as the rat got older and heavier more œstrone was required for a positive result. The author had the impression that after carrying out a series of tests on the one group of mice that they became less sensitive, but there is no clear evidence on this point.

Differences in the interpretation of the tests have given rise to some errors, as for example, 18 blood tests made from the 107th to the 219th day of pregnancy, of which two negative results were incorrect (Shtamler, Shukhgalter and Faiermark, 1933). From the 100th day of pregnancy onwards the gonadotropic hormone in the blood of the pregnant mare diminishes and errors of this nature are likely to arise. Indeed, Remlinger and Bailly (1934, *b*) came to the conclusion that pregnancy diagnosis was not possible in the mare from negative results obtained

with the Friedmann test in late pregnancy. Similarly a negative result from a blood test before the 42nd day of pregnancy is without significance. Likewise a negative urine test before the 60th day is of little value.

Errors in diagnosis from a biological test have been observed by most workers, but on the whole a very high degree of accuracy has been obtained. It has been noted that non-pregnant mares may excrete small quantities of œstrone in the urine, and the necessity of making a quantitative estimation of the hormone content of the urine has been emphasised. Approximately 800 m.u. of œstrone is the highest concentration that has been observed by the author in non-pregnant mares, and the demonstration of less than 1,000 m.u. of œstrone is not recognised as an indication of pregnancy, although it is suggestive. Miller (1935) has, however, found up to about 3,000 m.u. per litre of urine in non-pregnant mares with a history of cystic ovaries. The three cases already mentioned, in which the test showed amounts of 800 m.u. at an advanced stage of pregnancy, failed to show a concentration of 160,000 m.u., which, had the mares been pregnant, would have been demonstrable. A concentration greater than 800 m.u. might have occurred, but no examination for intermediate amounts was made. In such cases the safeguard lies in the demonstration of the concentration of œstrone which normally occurs at the particular stage of pregnancy. This, however, will only apply after about the 95th day of pregnancy, since it is not until this period that a concentration of 3,000 m.u. is exceeded.

The author has had one experience of a mare which gave a positive result but subsequently proved to be not in foal. The mare in question was at grass, and it appears probable that abortion occurred unperceived. Magnusson (1934) reports three such cases in which positive results were obtained with the blood test in both mice and rabbits, and believes that early abortion took place. Miller (1935) reports 21 cases which gave positive reactions but which eventually proved to be not in foal. He states that there was very strong evidence that abortion took place in three cases, and in another case the circumstances were at least very suspicious. In a further three cases at least it was assumed that cystic ovaries were responsible for the increased amount of œstrone found in the urine. In one mare a mummified fœtus was found, and in another the disentegrating remains of a fœtus. As a possible explanation of these mares which give a positive result but which are not pregnant, not due to subsequent abortion or ovarian abnormality, Miller advances the hypothesis that a deficiency of vitamin E in the diet of the mare may result in fœtal atrophy.

Summary.

1. The hormonal basis of the biological methods for the diagnosis of pregnancy in animals is reviewed.

2. The biological diagnosis of pregnancy is at present practicable only in the mare.

3. Since œstrone is excreted in the non-pregnant mare during the œstrous cycle, in non-pregnant mares which do not show any signs of heat and in nymphomaniac mares, the urine test employed is a quantitative one.

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4. The results obtained by different workers from the blood and urine tests are reviewed.

5. The treatment of urine to prevent mortality in the test animal, the best test animal, and errors in the test are discussed.

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THE VETERINARIAN IN A MEAT-FREEZING WORKS.

By R. E. ALEXANDER, M.R.C.V.S.

Wellington, N.Z.

In this article I shall attempt to describe the life of a veterinarian in a freezing works. My remarks are unofficial and, in places, of a light nature, my object being to picture the occupation from the point of view of human interest. Statistics and meat inspection problems will be ignored. Freezing works, like veterinarians themselves, differ in many respects, so I shall describe a sort of composite institution ; an account of which I hope will prove of interest to the readers of The Veterinary Journal.

The very sound of the words "freezing works" sends an anticipatory chill down the spine. One pictures forbidding brick walls ; railway lines with locomotives belching smoke, and a general atmosphere of industrial activity. Actually they may be found in all sorts of odd places. They may occupy a breezy situation on the sea-shore, or be found in a rocky gorge ; or standing in lonely majesty in the midst of fields. Factors which govern their position are, of course, communication and drainage. The general impression one receives at first sight is of a group of large buildings, one or more smoke stacks, with stock pens in the surrounding area. Often there are flower gardens, and trees and flowering shrubs in the grounds, and with river, sea, or mountains close by the veterinarian may find himself working in a very pleasant situation.

The various buildings comprise the slaughterhouses, cooling floors, chilling and freezing chambers, and the preserving, fertilizer and felmongery departments. While all these places concern the veterinarian from the sanitary aspect, we shall deal more particularly with the slaughtering department.

Sheep and lambs are slaughtered and dressed by the chain system, passing perpetually along a moving rail, of which, during the busy season, there may be four in operation. They leave the stock-yards through a race to the slaughtering-pens, being generally led by a decoy sheep which has been trained for the purpose.

I remember observing one of these pet sheep, rather an elderly gentleman, lying placidly in a corner and watching his unfortunate dupes with an unmoved countenance, as they awaited their turn in the slaughtering pen. I wondered if the perfidy of years ever troubled his conscience. Apparently it did not, for his eye was untroubled and his brow serene.

As the carcases move along the rail, men stationed at various intervals each perform their allotted task, until finally the dressing is completed. In mutton inspection the meat inspector is mainly concerned with the detection of caseous lymphadenitis, his survey in this direction being an intensive concentration on the lymphatic system. By palpation and incision is sought any evidence of what the meat inspector affectionately terms " lympho," and one can only admire the skill by which such lesions are sensed. After passing the grader at the scales

the dressed carcase travels by inclined rail or moving chains to the various cooling floors.

In the previous paragraph we mentioned the meat inspector. Let us return and chat with him for a moment. How does he like his job? We find he has a lively intelligence and a sound practical knowledge of meat inspection. He does not bother about such things as hormones or remote physiological problems, but he has an uncanny knack of instantly recognising a diseased carcase, where no doubt a professor of pathology, in the same situation, would have passed it by. He admits the work is apt to be monotonous, that the endless procession of sheep and lambs palls upon one after a few hours, and that the work is physically and mentally tiring. In his relations with the veterinarian, the latter will find the meat inspector cheerful and conscientious, and the practical knowledge of the one combined with the scientific outlook of the other should prove an ideal combination.

And what of the veterinarian? Does he dwell in majestic isolation in his office, occasionally appearing at intervals to pass the verdict on a doubtful case, thenceforth once more vanishing from the wondering gaze of ordinary mortals? Not exactly. In actual practice he can find plenty of employment outside his office, and—tell it not in Gath or whisper it in the streets of Askalon!—he must be capable in moments of stress of performing the meat inspector's work himself. Nay, furthermore (here we must assume a hushed whisper), he must not shrink from inspecting carcases on the very chain itself. And to make our revelation perfectly complete, we must mention that he is also concerned with the cleanliness of the worker's dress, wipers, of the buildings generally, and of such sordid things as drains.

The viscera from the sheep and lambs pass through chutes to the floor below, this portion of the works being dignified by the title of "gut-house," and the workers therein, "gutties." The workers above regard the gutties with a certain degree of superiority, but the latter gentry are quite cheerful and philosophic about the matter. And indeed, the running and preserving of guts is quite an art in itself, and considerable organisation is required for efficient working. The veterinarian must see that the same rule of cleanliness obtains here, and if he is interested in cestodes and nematodes, then he should be happy. He has also to certify to the purity of the edible tallow, and at times visit the preserving department.

Our old friend the pig travels on a chain also, but presents more complications than the sheep, owing to his liability to tuberculosis. In the past he has not been too popular with meat inspectors. If the porker or, worse, the baconer is suspended from a rail six feet above ground, by the time the inspector reaches the submaxillary region he is in a bending attitude reminiscent of a wilting lily. On questioning the inspector with regard to this attitude, however, you will find that his spoken thoughts are anything but flower-like. Measures are now being taken to remove this handicap by employing various mechanical

means to raise the pig to a more convenient level, thus preserving the examiner's back and temper.

Generally speaking the pig is a clean animal to inspect, but around it hovers a curious miasma or aroma. Habitual pig inspectors state that after passing some years in this atmosphere they tend to become pig-like themselves. That is to say, when spoken to they respond with a short grunt, and are liable to squeal upon being tickled.

Leaving the realms of what may prove to be pure fancy for those of facts, we now enter the beef house. This department provides the most interest from the point of view of meat inspection, as the monotony of the chain is lacking, and one appears to encounter a greater variety of pathological conditions. Judgment imposes more responsibility upon the inspector than in the case of the smaller animals. The cattle enter the slaughtering pen through a race from the stockyards, are destroyed by humane killer, and are then hoisted on the tackle. In some cases the cattle pass through a shower bath before being slaughtered. They may be killed apart from the main building, to which they are afterwards conveyed by a moving chain. With the increase of the chilling method of meat preservation rigid sanitary precautions have to be observed.

A simple layout eases the task of keeping the surroundings clean. The older works, where numerous additions have been made through the years and use is made of numerous conveyors and trucks for the passage of offal and skins, render this work more difficult.

The cooling chambers, with their myriad rails and vast floor space, need little mention. Over them broods an air of calm such as is found in an English cathedral close. The silence is only broken by the occasional shouts of the cooling floor staff, and the sharp " click, click" as the meat is branded with the imprint of New Zealand. Surveying these rows of pendant carcases, it seems strange to consider that a few months later they will be jointed and smoking on English dinner tables.

We shall not linger for long in the extensive but gloomy areas of the freezing chambers, where the icicles glitter in the artificial light, and where the occasional hooded figure of a freezing employee can be seen, muffled in multitudinous coats and sacking and reminding one of a monk in the ancient Spanish Inquisition.

We have made our tour of the freezing works, and now we turn finally to the veterinarian. He will find his job interesting enough provided he does not allow it to degenerate into a mere routine. The endless series of what are in reality post-mortem examinations should give him an acquantance with disease surpassed by few. Moreover, meat inspection involves so many sciences and presents so many varied conditions that he can only blame himself if there is lack of interest. With a microscope and a few stains he can explore the minute as well as the macroscopic, and, like every other branch of the veterinary art, there is always " something more to learn."

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MODERNISING OF COWSHEDS AND THE ADMINISTRATION OF DAIRY REGULATIONS.*

By JAMES MACKINTOSH, O.B.E., N.D.A., N.D.D.
Of the National Institute for Research in Dairying, Reading.

THE modernising of cowsheds has been and still is one of the chief problems confronting dairy farmers. The administration of dairy regulations has attracted attention from time to time and has become a matter of special interest since the introduction of the Accredited Producers' Roll Scheme by the Milk Marketing Board. These subjects are of great importance in the further development of the dairy industry in this country and deserve the closest attention.

Before attempting to discuss the principles which should govern the modernising of cowsheds, I think it is desirable that I should review the existing regulations which refer to dairy farm buildings. These regulations should have influenced the reconstruction of cowsheds and dairies in recent years and will in the future serve to a greater extent as the standards to which improvements should comply.

The Milk and Dairies Order, 1926.

The Milk and Dairies Order, 1926, (Part III, Sect. 6 (1)) requires that every sanitary authority shall keep registers of all persons in their districts carrying on the trade of cowkeeper or dairyman and of all farms and other premises used as dairies, and that no person shall carry on the trade of cowkeeper or dairyman or use premises as a dairy unless the person and premises are registered. The Order also requires that before using as a cowshed or dairy a building not previously used for that purpose, the occupier shall give the sanitary authority one month's notice of his intention. On receipt of an application, the applicant will be registered, but (under the Milk and Dairies (Amendment) Act, 1922, Section 2) if the public health is likely to be endangered by any act or default of a person who retails milk, such person or specified premises may be removed from the register.

The Milk and Dairies Order, 1926, also contains the following sections relating to cowsheds and dairies: "Every cowshed and every building used for keeping milk, other than a cold store, shall be provided with a sufficient number of windows or other openings suitably placed and communicating directly with the external air. The windows or permanent openings shall be such as to secure that the building is sufficiently lighted during the hours of daylight, and the openings provided for ventilation shall be kept in proper order and so used as to secure that the air in the building is kept in a fresh and wholesome condition." (Sect. 12 (1)).

"Every cowkeeper shall cause the floor of every cowshed in his occupation to be constructed of such material and in such a manner as to render it practicable

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to remove all liquid matter which may fall thereon, and he shall cause such cowshed to be provided with channels of rendered concrete or other durable and impervious material so constructed as to prevent as far as reasonably practicable the soiling of the cows and so as to receive all such liquid matter and to convey it to a suitable drain or other place of disposal outside such cowshed." (Sect. 25.) " A person shall not carry out any process of cooling, bottling, sterilising or pasteurising milk or any other process connected with milk, or keep any appliances connected with any such process, in a cowshed or in any place where the milk or appliances would be liable to contamination arising from any cowshed, stable or manure heap, or otherwise." (Sect. 16.) " All registered premises shall be provided with a supply of water suitable and sufficient for the requirements of this Order." (Sect. 13 (1).)

A study of these sections of the Order shows that the farmer who wishes to modernise his cowshed or erect a new one will find little to enable him to decide general dimensions or details of construction. No attempt is made to specify the minimum cubic air space, the area of window space nor the area of air outlets and inlets for each animal ; no dimensions are suggested for the width or depth of gutters and no materials are mentioned for the construction of the walls or mangers. The sections quoted are only definite in requiring that sufficient light shall be admitted, the air shall be kept in a fresh and wholesome condition, the floor shall be impervious and so constructed that the cows shall not be unduly " soiled," the drainage system shall be efficient, the milk shall be cooled and stored in a clean place not liable to contamination, and the water supply shall be adequate.

There will no doubt be some difference of opinion as to the wisdom of stating the results which should be attained, without stating the means which should be adopted to attain the results. My own view is that an Order designed to apply to the whole of England and Wales should not attempt to lay down definite dimensions and methods of construction of cowsheds. The variations in climate, altitude, exposure to winds and conditions of herd management are so wide that the housing accommodation needed varies greatly. I am convinced that the indefiniteness of the Order as to details is very much to be preferred to an attempt to state exactly how each cowshed chould be constructed.

Variety of Buildings Used as Cowsheds.

A consideration of the types of buildings which are now used as cowsheds in the South Midlands will illustrate this point of view more fully and show also how modernisation has been affected. My visits to numerous dairy farms had led me to classify the existing cowsheds into four groups. The first group includes the buildings which have been used as cowsheds for 100 years or more ; the second group comprises those buildings which were originally intended for the housing of fattening cattle and have been adapted for cows ; the third group includes the sheds or barns originally used for the storage of grain crops and which have had cow stalls fitted up over the whole or a part of the floor space ; the last group

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includes cowsheds of comparatively recent construction built according to modern ideas.

Farms with cowsheds in the first group are to be found mainly in the districts where milk production for the manufacture of butter and cheese was carried on before the growth of cities and improved methods of transport created the liquid milk market. Usually the cowshed consisted a of single row of stalls without stall divisions ; high mangers with stout wooden stanchions were common and the floor was usually rammed earth without efficient arrangements for drainage.

In the second group of farms the sheds are usually situated on one or more sides of a yard. They were often narrow, dark and badly drained, and similar in internal construction to the old-fashioned cowshed. Often also the yard outside the sheds was uneven, and access to the sheds could only be obtained through both solid and liquid manure.

The large barns adapted for use as cowsheds are found mainly on farms which at one time had, and may still have, a considerable proportion of arable land, and where cow-keeping was taken up during the last fifty years. These barns, by reason of their high roofs, usually have ample air space and adequate light is easily obtained by fitting sufficient windows in the sides. The arrangement of stalls has depended on the internal dimensions. In some instances, stalls holding one, two or more cows, according to the position of the internal pillars, have been fitted round the walls with an open floor space in the middle ; in others two rows of stalls have been put up along the length of the barn with a feeding passage in the middle and a milking gangway on each side, and in others the stalls have been arranged in rows across the length of the barn. Sometimes only a portion of the barn has been fitted with stalls, and the remainder consists of loose boxes or food stores. Generally the dimensions of the stalls, the drainage arrangements and the floor are more in keeping with modern requirements than in the single row sheds referred to above. Also, the situation of these barns is usually such as to permit satisfactory drainage arrangements to lower ground, and the surrounding yards can more easily be kept in a reasonably clean condition. On many farms in these three groups additional accommodation for cows has been provided by fitting stalls into other small sheds and by the erection of lean-to sheds against a convenient outside wall. In buildings of this type the roof is often low and there is not sufficient space behind the cows.

The cowsheds in the fourth group are, as a rule, well designed and equipped and do not require further mention.

From the foregoing description of the types of buildings which have been adapted to accommodate cows, it will be readily understood that had the 1926 Order required conformity with specific dimensions many of the buildings would have been condemned. This course of action would have entailed heavy expenditure in improvements, or would have reduced the number of cows which could have been housed, thereby limiting the income obtainable from the farm. There are, however, some farms with buildings used as cowsheds which should not

be permitted for this purpose in their present condition. They are too dark, or too small, or the floor is porous, or there is no adequate gutter.

Principles of Cowshed Reconstruction.

When considering the modernising of cowsheds it is necessary to have in mind the essential features of such a building. The objects for which a cowshed is constructed are that the cows housed in it shall not suffer in health, shall be comfortable and easily kept clean to simplify the production of clean milk, also that the cleaning of the shed and the feeding of the cows shall be possible with no undue expenditure of labour.

To maintain the health of the cows good ventilation and fresh air is necessary ; outlets for heated foul air should be provided in the roof, and inlets for fresh air in the walls ; fresh air may be admitted by windows made to open inwards, or in single row sheds by fitting into the wall at the cow's head a number of curved drain pipes or wooden inlets—one for each stall—so that the current of inflowing air is directed upwards and no draught blows directly on to the cows. Better ventilation is needed in sheds where the cows are housed during the night than in sheds used for milking only, and still better ventilation where the cows are indoors day and night, to secure "that the air in the building is kept in a fresh and wholesome condition."

The windows inserted for ventilation purposes will also admit light, but fairly uniform distribution of light behind the cows is essential so that the milkers may see when the hindquarters and udder are clean. In the barns adapted for cowsheds previously referred to and in double-row cowsheds where the cows face inwards, light should be admitted through the side walls, but where cows face outwards —a better arrangement—light will be more effective when admitted from the roof or from large windows in the gables so that " the building is sufficiently lighted during the hours of daylight."

The construction of the manger, stall and gutter is most important for securing comfort and cleanliness. A high manger and a long stall are common defects in sheds erected or adapted previous to some twenty years ago. A high manger makes a long stall necessary, and when the cow stands up to the manger to eat she frequently fouls the rear part of the stall, then, when she lies down after eating, her hind quarters and udder become very dirty and difficult to clean. A manger with a low front, say eight to ten inches in height, permits a cow to lie down with her head over the front ; the stall then need not be more than four feet nine inches to five feet three inches from the manger to the gutter, varying according to the size of the cow, and with these dimensions the manure will as a rule fall into the gutter. The gutter should be at least six inches below the level of the stall, at least two feet wide and gently graded to convey liquid matter to a suitable drain outside the cowshed.

There is some difference of opinion whether the gangway behind the gutter should be raised to about the level of the stall or should merely slope gently

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upwards from the lower side of the gutter. With the latter construction the cows have no gutter to step over on entering the stall and are less likely to slip. Both methods of construction are good, provided the stall, gutter and gangway are impervious, easily cleaned, but not slippery. Concrete finished with a wooden float, or slightly roughened by brushing with a stiff broom while still soft, will give a satisfactory foothold. Preparations are also available for mixing with the concrete to give a non-slip surface.

The improvement of sheds with high mangers and long stalls is often more easily done by laying a new floor on the existing one than by removing solidly constructed mangers. This method was adopted with success in an old cowshed formerly in use at the Institute. An uneven floor of bricks or cobbles can be made impervious by laying a covering of concrete with suitable slopes. I prefer to have the front as well as the rear part of the stall laid with concrete. In our own cowsheds we have had no trouble from big knees in concrete stalls, mainly, I believe, because we have manger divisions. Where there are no manger divisions a cow is tempted to try to reach the food in front of the next cow and her knees may be injured against the manger kerb.

Where new stall partitions and ties are necessary I prefer tubular iron fittings with chain ties; chain ties allow the cows to lie down and get up with greater comfort than the stanchion ties, and are also less expensive.

Farm Dairies.

The provision of suitable premises for the cooling of the milk and storage of the milk utensils has been a real difficulty on many farms. Where butter or cheese-making had formerly been practised, rooms were often available which could be easily adapted for these purposes, but on farms where cows have replaced fattening cattle no suitable building was available, and the cooling of the milk, washing and storage of the utensils has often been carried out in passages and sheds where neither the milk nor the utensils could be adequately protected from contamination. Small sheds or loose boxes have often been converted into cooling rooms by laying on water, putting down a concrete floor with suitable slope and drainage outlet, but, with the introduction of steam sterilisation as an almost essential part in the management of milk utensils, a building with at least two rooms is necessary. One room should be used for the cooling and storage of the milk and another adjacent room for washing and sterilising; sometimes the boiler is placed in the washing room, but a third compartment for its accommodation is a better arrangement. New dairies on these lines have been erected on many farms in recent years, but there are many others where considerable improvements are needed to comply with the conditions of the Order.

A good water supply is also essential for the cleaning of the cowshed, washing the utensils and cooling the milk. In this connection we should remember that the Milk Marketing Board contract requires all milk to be cooled to 60°F. immediately after milking. The provision of an adequate water supply is a serious problem on many farms.

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With regard to the cost of improvements I do not propose to go into details. In each case the cost will depend on the extent to which new fittings are required and the amount of materials and labour needed to relay stalls, gutters and floors; the variation from farm to farm is very wide. Small improvements can often be carried out by intelligent farm labour, a more extensive scheme may require the services of a builder, and in some instances it will be more economical to erect a small shed for milking purposes only and milk the cows in relays. One important point is that the improvements should be correct in principle and reliable advice should be obtained before the work is undertaken. Agricultural organisers and their staffs have done much valuable work in this respect, and much helpful information can be obtained from the bulletin on the Construction of Cowsheds issued by the Ministry of Agriculture.

The Milk (Special Designations) Order, 1923.

Up to this stage I have referred only to the Milk and Dairies Order, 1926, and to the adaptation of cowsheds and farm dairies for milk production under the Order. The enforcement of this Order, except the sections dealing with the health and inspection of cattle, is the duty of the sanitary authority. Before attempting to discuss the general question of the administration of dairy regulations, I must refer to the Milk (Special Designations) Order, 1923. This Order gives the Minister of Health power to grant licences to producers to sell milk as "Certified" and Grade A (Tuberculin Tested), and gives County and County Borough Councils power to grant licences to producers to sell milk as "Grade A." The conditions under which such licences are granted specify the procedure as to the tuberculin testing (for the first two grades), inspection, isolation and identification of the cows and the maximum bacterial content permitted in the milk at any time before delivery to the consumer, but do not lay down any definite requirements as to farm buildings, equipment or methods. This aspect of the question is dealt with in a general condition which is as follows: "The arrangements and processes under and by which the milk is produced, stored, treated and distributed, as the case may be, shall be such as to satisfy the licensing authority that the conditions subject to which the licence is granted are being and will be complied with." (Second Schedule (1).)

The Milk (Special Designations) Order, however, only applies to those who wish licences to use the special designations, whereas the Milk and Dairies Order applies to all producers registered by the local authority.

Administration of the Orders.

We therefore have the position that the sanitary authority is responsible for the inspection of dairy farms to ensure that the requirements of the Milk and Dairies Order are complied with, and that when farmers apply for a Grade A licence, the County Authority is responsible for the inspection of the premises and the methods and for the taking of samples to ensure that the milk is of the required bacteriological condition. Unfortunately, we cannot assume that if a farm complies with

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the Milk and Dairies Order to the satisfaction of the sanitary authority, it will also produce milk which will comply with the requirements of the Milk (Special Designations) Order, for two reasons. One of these is that the administration of the Milk and Dairies Order receives little or no attention from some authorities, whereas others, even in the same county, carry out farm inspections with commendable efficiency. Another reason is that the bacteriological condition of milk cannot be judged with any reasonable degree of accuracy merely by an occasional inspection of the condition of the cows and buildings and the methods of production. The results of county clean milk competitions have shown repeatedly that milk of a high hygienic standard can be produced in buildings which many sanitary authorities would consider unsuitable, because the farmer and his staff pay attention to the essential points—a clean cow, milked by a clean milker into a clean sterilised pail and the milk cooled to as low a temperature as possible over a clean sterilised cooler and transported in a clean sterilised container.

In addition to the failure of many Sanitary Authorities to carry out their duties under the Milk and Dairies Order, there is also a lack of uniformity on the part of County Authorities in their administration of the Milk (Special Designations Order. This variation has become common knowledge since the introduction of the Accredited Producers' Roll Scheme. The response to this scheme had been so great that counties had to improvise at short notice a system of inspection and control. This system varies from county to county ; in some the inspection of farms is carried out entirely by the staff of the Health Department, in others the same work is done entirely by the Agricultural Organiser and his staff ; in others veterinary officers inspect farms as well as cows and also take samples of milk, and again in others a system has been devised and operated jointly by the Health and Agricultural Advisory Departments. This variation in methods may be regarded as an evolutionary process by which the most suitable will be discovered and generally adopted, but there appears to be a variation in interpretation of the conditions under which licences are granted which is highly regrettable. I cannot quote definite illustrations, but the volume of complaints indicates that there must be definite evidence that the conditions of milk production and treatment accepted in some counties are considered quite inadequate in others. The granting and continuation of a licence should depend mainly on the evidence of the bacteriological condition of the samples and these should be taken sufficiently frequently to ensure that the milk does in fact comply with the conditions of the Order.

The chief causes of inefficiency and lack of uniformity in the administration of the above-mentioned Orders most probably are a lack of appreciation of the need for cleanliness in milk production, the difficulty of administering an Order where the standards to be attained cannot be precisely defined and the cost of systematic inspection.

It is, however, more important to consider how the existing defects can be remedied. One method would be the issue of Orders from the Ministries of Health and Agriculture with explicit definitions and instructions. By this means we should get uniformity in such matters as the sampling of milk and perhaps

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also in the installation of equipment such as milk coolers and steam sterilising plants for milk utensils, but this method cannot be applied to the construction and internal equipment of cowsheds because of the variation in local conditions throughout the country.

Where definite instructions cannot be issued from Whitehall, uniformity and efficiency in administration must depend on the knowledge, discretion and good will of the local and county authorities and their officials. To attain this end I consider it desirable that there should be closer co-operation between County Agricultural Advisory Departments and the Health Departments of the various districts and counties.

The desirability of this co-operation was recognised and urged by the Ministry of Health in a circular issued to County and Sanitary Authorities in 1927. The Ministry said that although the responsibility for the administration of the Order must rest entirely with the Sanitary Authority, in many areas this task will be sensibly lightened by co-operation with the Agricultural Education Authority for the County, whose education work, as far as it deals with the production of clean milk, is designed to secure substantially the same objects. In some counties a high degree of co-operation has already been developed, but in others little progress has been made.

In addition to a co-ordination of effort within the county there is evidently need for more harmonious interpretation and administration between counties. The Ministry of Health could assist greatly in this respect by providing a number of officers with experience and tact who would visit the various counties and aid in directing administration along uniformly sound lines. Where natural conditions are diverse, uniformity can only be obtained by the general acceptance of the same guiding principles and the application of these principles with knowledge and understanding.

PREGNANCY TEST.

By ZAKI MORCOS, F.R.C.V.S., M.V.Sc., D.V.H.
Veterinary School, Egyptian University.

Literature.

(1) Benjamin, Harrow and Carl P. Sherwin reported the following: The corpus luteum and the anterior pituitary gland developed hormones which played their rôle in the sex activity of the female.

During the anabolic phase of the cycle, the epithelium of the vagina grew to a considerable thickness and a cornified layer similar to that in the epidermis developed.

During the catabolic phase, the outer layer of the epithelium degenerated and was removed by leucocytes, hence the microscopic examination of the vaginal smears was a reliable indicator of the œstral condition of the living animal. These

cyclic phenomena in the genital tract ceased entirely on double ovariectomy, and on inoculation of urine or serum containing the corpus luteum hormones into ovariectomised animals œstrus was produced.

Frank has shown the presence of an œstrus-producing substance in the blood of pregnant females by injection of same into castrated adult white mice.

Hislow claimed that the corpus luteum contained three active hormones, *Relaxin*, which had a specific action on the pelvic ligaments, *Progestin* (corporin), which produced a premenstrual endometrium, and *Theelin*, which produced the mucification reaction.

Curtis isolated one gram of Theelin from ten gallons of urine from pregnant mares.

(2) Aschheim and Zondek carried out the following method :—

Five immature female mice three to five weeks old and six to eight grams in weight were subcutaneously inoculated with the morning urine of the suspected case. Each mouse was injected with 0·3 c.c. urine twice a day for three days ; post mortem was made 100 hours later, and three reactions were noted :—

Reaction I.—Ripening of the follicles, ovulation œstrus, indicated by increase in size of the premordial follicle and the development of a cumulus ovum seen in the Fallopian tube at such a stage.

Under the influence of the anterior pituitary hormone, the corpus luteum formation then followed, and œstrus produced and recognised by the enlargement and congestion of the uterus, hypertrophy of the vaginal membrane and cornification of the upper cell layer.

Reaction II.—Through the greatly dilated blood vessels of the ovaries, macroscopic hæmorrhagic spots, giving the ovaries a mulberry appearance, were seen.

Reaction III.—Luteinisation of the follicles and formation of the corpora lutea arterica took place so rapidly as to imprison the ovum.

Reading of Reactions.

Reactions II or III were diagnostic, while Reaction I was considered suggestive or negative.

In this test the following remarks were quoted :—

1. Morning urine was collected, not necessary in a sterile container.

2. One drop of lysol or tricresol was added to the ounce of urine as a preservative. Excess of preservative was avoided, as it killed the animal.

3. Old mice and young ones were avoided, as the former gave false reaction and the latter did not tolerate the injections.

4. Gladys Dodds used virgin rabbit 12 to 20 weeks old. The rabbits weré intravenously inoculated with 6 c.c. urine on two successive days. On the third day, 24 hours after the second injection, the animal was killed and inspected for corpora hæmorrhagica. Sterile urine was not necessary.

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5. Arthur Hale Curtis inoculated rabbits intravenously with serum of suspected pregnancy cases, 1 c.c. serum per 600 grams weight of rabbit.

6. Peterson, Harris and Webster described the Abderhalden Serodiagnosis test as follows :—

On the addition of 0·2 c.c. solution of a 1 per cent. aqueous solution of ninhydrin to the serum of suspected pregnancy cases, the mixture turned a *characteristic violet blue* if the case was pregnant ; if no colour appeared, it was assumed that the serum was from a non-pregnant case.

This reaction was supposed to be due to the presence of a specific ferment which possessed the property of digesting placental tissue.

The test was applicable from the sixth week after the last menstruation until the end of the third week post partum.

Experimental.

Technique adopted.—Female immature rabbits 30 to 60 days old were used.

50 c.c. bottles containing either 0·5 c.c. chloroform, or 1 c.c. ether, were filled with suspected urine ; dilution of antiseptic being 1 per cent. chloroform or 2 per cent. ether. Urine was collected under non-aseptic conditions.

Before inoculation, the bottles were placed in the incubator for two hours, cork being taken off to get rid of most of the antiseptic.

The rabbits were inoculated intraperitoneally on two successive days and slaughtered on the morning of the fourth day for post mortem.

Bottles containing urine and antiseptic were left at room temperature, apparently contaminating bacteria destroyed the hormone and not the heat of room temperature.

First dose was 7 c.c.; second dose, 24 hours later, 8 c.c. ; post mortem 48 hours after the second dose.

Urine from pregnant cases caused most evident thickening of the horns of the uterus and brown hæmorrhages, three or four, about one to three millimetre in diameter (*see* photo). The test is applicable 14 days after the last menstruation.

Ether added to urine is preferable to chloroform, the latter being more irritating to the tissues of the animal.

Chemicals in the same dilution plus normal urine caused no change.

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Pregnancy Test.

(*Article by* Zaki Morcos, F.R.C.V.S., M.V.Sc., D.V.H., *page* 222)

The Sternum in Ectopia Cordis.

(*Article by* Howel V. Hughes, B.V.Sc., M.R.C.V.S., D.V.H., *page* 225)

Clinical Articles

A Wound in a Mare's Abdomen, with Unusual Features.

By E. G. CONISBEE, M.R.C.V.S.,
Axminster.

ONE afternoon in the autumn of last year a message was delivered by a lad to the effect that there was something wrong with a mare's belly. When seen there was a more or less circular gaping wound, three or four inches across, in the abdominal floor at the level of its lowest point, but about six inches or so from the middle line, in a good type but aged cob. The depth of the wound was limited by the peritoneum, the extent of which was exposed, being about three inches in length and the width of two fingers in breadth. Through this, which did not appear injured or even disturbed, could be seen what looked like a portion of gut with fluid content lying flat upon a portion of the inner surface. That it was not herniated in the least seemed remarkable. Moreover, it was assumed by the owner that the wound had been inflicted the previous day by either the stock bull or the stock boar, both of which animals had broken bounds. Although he could not understand the mare, knowing her temperament, allowing either to have got near enough to have inflicted such an injury. After cleansing, it was thought wisest to attempt to pull the separated muscles together by tape sutures attached to quills and to leave the skin wound open. The only quills that could be produced on the farm were some that had once graced ladies' hats, and these were of course dyed. Hesitation was expressed to their use; dye immediately began to stain the water they were placed in. But there was nothing else to be got. Four or five tape sutures were inserted, all being tied to one quill on one side of the wound, and some to each of two others on the other side ; by this means the muscles were made to meet closely. Given anti-purulent vaccine and careful treatment of the wound, progress was satisfactory until the sutures had been removed and the skin had healed. Then slight hernia was produced, and it was the owner's conviction that it was caused by a sudden movement of the mare while being led and on hearing hounds about.

The Sternum in Ectopia Cordis.

By HOWEL V. HUGHES, B.V.Sc., M.R.C.V.S., D.V.H.
Department of Veterinary Anatomy, The University, Liverpool.

IN a previous communication* relating to a case of cervical ectopia cordis in the calf, I drew attention to the fact that the sternum was imperfectly developed, and the suggestion was made that, instead of the abnormality being simply a retention of the heart in its embryonic position in the neck, as some believe to

* *Journ. of Comp. Path. and Ther.*, vol. xlvii, p. 144, 1934.

be the case, the condition was the result of a failure of the lateral walls of the embryo to meet completely in the mid-ventral line, and as a consequence the heart by a process of rotation around a horizontal transverse axis became transposed from the thorax into the base of the neck.

It has been my good fortune to secure the heart and sternal region of a second case of this malformation in a calf, and it is interesting to find that the parts bear a striking resemblance to the corresponding parts of the first case described.

The heart was transposed with its apex pointing towards the head, and the anomalies in connection with this organ which were found in the first case, *e.g.*, the double anterior vena cava, were also observed in the present case. The accompanying illustration of the sternum shows the extent of the cleft. The two halves were attached to each other by fibrous tissue almost throughout their length. Only in the region of the last segments and at the ensiform cartilage was the cartilage of one side continuous with that of the other. (It should be noted that normally the union of the two cartilaginous bars from which the sternum develops commences anteriorly and extends backwards.) As a result of this failure of the two halves of the sternum to unite normally, the ribs and their cartilages were widely separated, the width between the first pair of costal cartilages at the chondro-sternal joints being about 4½ ins., whereas in a normal calf they are within ½ in. of each other.

The case is reported as supporting the suggestion that in all instances of cervical ectopia cordis the two halves of the sternum are either quite distinct or are incompletely united, and that this defect is responsible for the transposition of the heart. The writer would welcome further specimens of the condition for examination.

Hemlock Poisoning and Sugar-Beet.

By J. M. BUCHANAN, M.R.C.V.S.
Stowmarket.

POISONING by hemlock has been recorded at various times. The other week I had an outbreak among eight heifers turned out to graze for the first time.

The meadow was about 20 acres of good grass, and the heifers had been in all winter. When seen next day they were found by the owner to be dull and not feeding. I was called next evening. Three were blind, staggering, and showing diarrhœa. Round the edges of the field, cowbane and hemlock were found, obviously having been eaten. Fools' parsley was profuse, but it is not supposed to be poisonous (?). Treatment consisted of saline purges and 24 hours' starvation. Milk was allowed *ad lib.* and water next day. Six made uneventful recoveries but show signs now of poor thriving. Two succumbed and revealed gastro-enteritis on post-mortem. Prior to death, one of these showed excessive salivation and died in agony in spite of heroic doses of morphia.

Sugar-beet pulp is a favourite foodstuff: whether it contains any poisonous principle is a moot point. I was called the other week to six " blown " bullocks,

one dead and the others staggering and hoven alarmingly evident. Heroic measures with a trocar and cannula relieved the more pressing symptoms. Post mortem on the dead one revealed, of course, an overloaded stomach. The animals had come straight from market and fed ravenously. A young lad had fed them, and his measure consisted of "a shovelful or two of beet pulp," unlimited kositos, bran, oats, and linseed cake. The pulp had been soaked for 36 hours, the excess water drained off and then fed. Lander, quoting Goodwin and Continental writers, refers to beet pulp only *en passant*. Opinions of others would be welcomed by me.

I may add, after the usual saline purges and starvation the other bullocks recovered.

Hypocalcæmia in the Bitch.

By W. R. McKINNA, M.R.C.V.S., D.V.S.M.
Huddersfield.

In The Veterinary Journal for February, 1936, a short note on this condition was given, and one of the subjects concerned was an eighteen months old fox-terrier bitch. This bitch showed then very marked "parturient eclampsia," recovering quickly after a subcutaneous injection of calcium borogluconate. The same animal three weeks after whelping—and this was the succeeding pregnancy—again developed the same alarming symptoms. The tetany of the limbs was so pronounced as to make her whole body completely "board-like." Without expert assistance, so marked was the rigidity of the hind limbs, an intravenous injection of 10 c.c. calcium borogluconate was administered without any difficulty. A further amount was injected subcutaneously. The result was apparently miraculous, and half-an-hour later the bitch was standing at the kennel door barking. No sedatives or other treatment was given. The condition is not a common one, and that it should occur in the same animal at the next pregnancy suggests that the case is of sufficient interest to record. Further, the specific action of calcium intravenously gives such rapid relief that sedative treatment proves quite unnecessary.

MINISTRY OF HEALTH.
THE MILK (SPECIAL DESIGNATIONS) ORDER, 1936.

The Minster of Health, after consideration of the representations made to him and after consultation with the Minister of Agriculture, has now made the new Milk (Special Designations) Order which will come into operation on the 1st June next.

Principal Objects of the Order.

The new Order has two main objects: to transfer from the Minister to Local Authorities the duty of granting licences to producers of certain graded milks, and to improve and simplify the special designations of milk.

Local Authorities to grant Licences.

The Minister of Health undertook the work of granting licences to producers of Certified and Grade A (Tuberculin Tested) milks only while the graded milk scheme was in its early stages. This work is appropriate to local authorities who already grant all other licences under the scheme, and the number of licences has now increased to an extent which makes devolution necessary.

The New Designations.

An alteration in the designations of the grades of milk is also much needed. The present designations are "Certified," "Grade A (Tuberculin Tested)," "Grade A" and "Pasteurised." The existence of so many grades creates confusion, and some of the designations are not such as to give to consumers a clear indication of the nature of the milk purchased. Accordingly it is proposed to reduce the number of grades to three: "Tuberculin Tested," "Accredited" and "Pasteurised."

"Tuberculin Tested" Milk.

"Tuberculin Tested" will replace the existing designations "Certified" and "Grade A (Tuberculin Tested)."

The chief characteristic of "Certified" and "Grade A (Tuberculin Tested)" milks is that they both come from herds which have been subjected to a stringent test for the absence of tubercle. The new designation "Tuberculin Tested" which, when the Order comes into force, will be the only designation for raw milk from tuberculin tested cows, will indicate this characteristic more clearly than the existing designations. Safety from tuberculosis is of the highest importance to public health, and those consumers who purchase "Tuberculin Tested" milk will know that it is the raw milk which affords the best protection against tubercolosis.

"Tuberculin Tested" milk may, if desired, be pasteurised, subject to the conditions of the Order, and where this is done, it must be sold as "Tuberculin Tested Milk (Pasteurised)." This milk will have the double security of tuberculin testing (as a safeguard against bovine tuberculosis) and pasteurisation (as a safeguard against all milk-borne diseases).

"Tuberculin Tested" milk will be subject to bacteriological tests, which are of great importance for the purpose of ensuring the cleanliness and good keeping quality of milk. But these tests are not tests for disease-causing organisms, and Sir Kingsley Wood, having regard to the need for simplification, has not felt it necessary to retain the specially stringent bacteriological test which is at present applied to "Certified" milk. The only other material characteristic of "Certified" milk is that it is required to be bottled on the farm. Accordingly, when the new grade of "Tuberculin Tested" milk is bottled on the farm the Order will permit it to be described as "Tuberculin Tested Milk (Certified)." This will be of advantage to producers who now hold licences for the production of "Certified" milk and desire to retain in some form the use of this designation.

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"Accredited" Milk.

"Accredited" milk will replace the present "Grade A" milk and be subject broadly to the same conditions, *i.e.*, it will be raw milk from cows which are regularly inspected by a veterinary surgeon, but are not tuberculin tested. It will be subject to the same bacteriological test as "Tuberculin Tested" milk. The designation "Accredited" will carry a clearer meaning than "Grade A," as it will indicate that milk sold as "Accredited" comes from the herds of producers enrolled under the Accredited Producers Scheme initiated by the Milk Marketing Board. This scheme has already met with considerable success, and there are now nearly 16,000 producers enrolled under the Scheme. Where "Accredited" milk is bottled on the farm the Order will permit the words "Farm Bottled" to be added to the description.

"Pasteurised" Milk.

"Pasteurised" milk will, as at present, be milk which has been held at a temperature of 145 deg. to 150 deg. F. for 30 minutes. There has been no need to alter this designation, as it indicates clearly that milk so described gives the protection which pasteurisation affords against all forms of milk-borne disease.

Bacteriological Tests.

After the 31st December next, the present method of prescribing the bacterial standard by a "plate-count" test of 200,000 bacteria per millilitre will be superseded in relation to raw "Tuberculin Tested" and "Accredited" milks by a colour test as recommended in the recent report of the Medical Research Council (Special Report Series No. 206). The test for coliform bacillus will, however, be retained as at present.

Permission to use up Stocks of Bottle Caps, etc.

In order that existing stocks may be used up and unnecessary loss to producers and distributors avoided, bottle caps and labels complying with the existing Order will be allowed until the 31st December next, but apart from this it will not be permissible after the 31st May to sell milk under any of the designations which the new Order abolishes.

Other Provisions of the Order.

The new Order contains a number of other provisions, including a power to licensing authorities to charge less than the prescribed maximum fees for licences, if they wish to do so, or to forgo fees altogether.

Circular to Local Authorities.

A circular explaining the new Order is being sent to Local Authorities. This deals with a number of administrative points, including inspection and sampling. Amongst other matters, the attention of Local Authorities is drawn to a new chemical test (the phosphatase test) for determining whether or not milk has been properly pasteurised.

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Abstracts of Current Literature

Survey of the Diagnostic Investigations with Respect to Infectious Abortion carried out at the Veterinary Institute, Oslo, Norway, in 1935. By Professor H. HOLTH, *Norsk Veterinær Tidsskrift*, No. 4, 1936.

THE author mentions in the introduction that it has of late years become more and more usual, when tuberculosis in cattle and infectious abortion are being dealt with in the professional press abroad, to speak of Norway as being in the happy position of having very little of these destructive diseases. This is true enough, but what seems to be forgotten is that it is the result of a systematic campaign conducted throughout a long series of years. As a matter of fact, we originally had also in the country more than enough of these scourges, and if the work of preventing their diffusion had not in time been taken up in earnest there is no reason to suppose that Norway would now have been materially better situated in this respect than a number of other lands in which these infectious diseases have from year to year occasioned very severe losses.

As regards tuberculosis, the combating thereof has proceeded during over 40 years, with the result that tuberculosis in cattle has been so greatly reduced that we are now beginning to sight the prospect of its final eradication.

The campaign against infectious abortion was begun about ten years later, but the first efforts to combat this evil proved, on the contrary, extremely disappointing, as the lack of serviceable means of diagnosis rendered it impossible to distinguish between the frequently occurring sporadic cases of abortion and the infectious form.

It was not until after (in 1912) it became possible to get blood-samples and other material examined in the laboratory that progress in the work of combating the disease could be noted, and according as it was found that the tests applied were sufficiently exact from a diagnostic standpoint to satisfy the practical requirements, the effectivity of the efforts became greater and greater and finally the progress became exceedingly rapid.

In course of time a great many infected herds were detected and the diffusion of the disease was mapped out as regards large parts of the country, and it is found that the infection is now least prevalent in those districts where the work of combating was early commenced.

The mode of procedure in combating the disease has varied somewhat in the different herds, as account had to be taken of the local conditions and the economic position of the owners. For details of the matter the author refers to earlier published reports and articles.

As the most reliable, simplest, and in the long run cheapest, method of getting rid of the disease the author has during many years been recommending the slaughter of all reacting animals in the herd, combined with thorough cleansing

of cowsheds and utensils, this work being carried out as far as possible in the spring.

This procedure, when systematically carried through, has always yielded good results and has rapidly led to the desired result in herds in which infectious abortion is chronic, whereas it has in general taken a somewhat longer time and necessitated several examinations of the blood in case of first outbreaks of the disease.

Many cattle owners, however, did not venture to take up the combat according to this plan, as they were afraid of fresh infection from neighbouring herds or were not so situated economically that they could bear the loss (temporary, it is true, but yet rather heavy) which such a mode of procedure entails. Therefore it became necessary to adopt a more systematic plan of campaign and to secure financial support from the authorities, if the result of the efforts to combat the disease were to be quite satisfactory.

There were, it is true, no grounds for complaint as regards the situation in general, seeing that the progress of the disease had long since been checked, while at most places it also seemed to have steadily and surely declined; but as it would pay well from the standpoint of national economy to increase the rapidity of this decline, the author found it justifiable strongly to recommend that the Department of Agriculture should allot a larger amount in the annual budgets to meet the expenses connected herewith, since there could hardly be imagined a more rational application of grants for meeting the agricultural crisis than to supply funds to promote the slaughtering of inferior cattle, which, moreover, are producing milk injurious to health.

The Veterinary Director took up the matter, and he succeeded in getting allotted Kr. 250,000 yearly, which grant was afterwards increased, so that for the calendar year 1935 one million kroner could be applied by the state for this purpose, while for the present budget year Kr. 400,000 have been granted for the same object. The money is to be applied for payment of the cost of sending veterinarians to the infected or suspected farms, for payment of the veterinarians for the taking of blood samples and conducting the work of disinfection, as well as for compensation grants to the owners of animals slaughtered, which grants vary between Kr. 30 and Kr. 100 per head according to the animal's age.

After the Veterinary Director had prepared a detailed description of the mode of procedure to be adopted and the Department had issued a number of new regulations with the object of preventing the spread of infection, the campaign against the disease could begin.

As regards the method of investigation, the diagnosis was, in 1935, based mainly upon the result of the agglutination test, while the complement-fixation test was applied only when the former test had given doubtful results. In earlier years both methods had as a rule been employed, which procedure, however, proved difficult to carry out in case of mass investigations. As positively reacting animals are regarded, all those in which 0.05 c.cm. of serum, or smaller quantities,

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give complete agglutination with an antigen dose of 1 c.cm., or which, in the cases where the agglutination with 0.05 c.cm. of serum is only partial, show a positive result in the complement fixation test (0.5 ccm. of a 1 per cent. blood suspension) on employment of 0.1 ccm. of inactivated serum. Experience shows, however, that all reacting animals are not detected at the first examination, and the accuracy of the examination will therefore undoubtedly be greater if the double test is employed. The author considers it necessary also to slaughter animals which react only slightly, or unevenly, as these may now and then be infected and thus be liable to spread the disease.

In the course of 1935, altogether 131,752 samples from cattle were sent in for examination, of which 10,058, or 7.63 per cent., gave positive reaction for infectious abortion, while 299, or 0.23 per cent, were suspicious and 121,395, or 92.13 per cent., gave negative reaction. A large number of herds had, however, been examined several times, so that these figures yield no very precise information as to the frequency of reaction. 1,935 of the samples came from market cows of which 10 gave positive reaction.

The number of herds examined amounted to 11,924 (market cows not being included here). In 3,907 herds abortion had occurred and in 1,331 of these there was found positive and in 3 of them suspicious reaction, *i.e.*, 34.14 per cent. of the aborting herds proved to be infected or suspicious in this respect. In the said herds there were found 7,520 aborting cows, of which 2,956 gave positive and 35 suspicious reaction, or altogether 39.77 per cent. reacting or suspected animals.

In 923 herds, regarding which no information as to abortion was available, there came one or more positive reactions and three such herds were suspicious. In 9,664 herds the tests gave negative reaction, but 161 of these had, however, in previous years been infected.

Of calves and young cattle under one year old, 188 showed positive reaction, making 1.87 per cent. of all the reacting animals. 42 of these gave negative reaction at the first examination or examinations, and afterwards, up to ten months later, positive reaction. This circumstance confirms an observation often made on earlier occasions, namely, that the abortion bacillus, at any rate in young cattle, may lie latent somewhere or other in the organism for long periods, and it is therefore necessary repeatedly to test the young animals, in order to avoid a recrudescence of the infection in the individual herds.

The results of the year's campaign against abortion must be described as very satisfactory. Thus, out of altogether 2,260 originally infected herds 507 showed negative reaction at the two last and 858 at the last blood examination, and at the beginning of this year 636 herds could be declared free from infection. Since the new year these figures have surely and steadily risen, according as renewed tests have been made, and by the 1st of March the number of herds declared free from infection had already reached 978.

It is true that in many herds it takes time to find out all the reacting animals,

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since the blood tests cannot, for practical reasons, be made so often as would be desirable (the intervals are usually three months), and the occurrence of reaction in the young cattle and the capricious behaviour of the reaction in older animals may give rise to difficulties, but with patience the difficulties can be overcome.

From time to time also new herds suffering from infection are being found, and although the number of these has hitherto not been disquietingly large, yet taken altogether they may be expected to amount to a good many, when all that must be investigated has been thoroughly sifted. All in all, however, there should be good hope of getting rid of very nearly the whole of the disease in the course of a comparatively short time, and even if it is not found possible to track down all the infected herds, the stringent public regulations against the disease will prevent these herds from occasioning any great spreading of infection.

In addition to the examinations of cattle, diagnostic investigations were, in 1935, carried out also in some other animals, as well as in human beings. As regards the latter, however, the number of tests made by the Veterinary Institute has greatly declined, as these tests are now being carried out by other institutions.

In horses, 25 examinations were made, of which six gave a positive, one a suspicious and the rest a negative, reaction. Of sheep, 15 were tested, of which four were stated to have aborted. All of them showed negative reaction. Of goats, 15 were examined, one only, which had not aborted and which was kept in a shed together with greatly infected cattle, giving positive reaction. Of sows, two were tested and gave negative reaction. One of them came from a farm where abortion had occurred among the cattle. Both of the sows had aborted, and on one of the farms two young sows had also aborted in 1934. Of foxes, three were examined with negative result. One of them, which had been fed with the uterus from an aborting cow that reacted positively (which feeding is forbidden), aborted ten days after being given this food.

Of human beings only five were tested, whereof one gave a strongly positive reaction. The reacting sample came from a man aged 37, who had felt unwell and debilitated for three or four weeks and in the last few days had been feverish. There was abortion infection among his cattle.

News

NATIONAL ASSOCIATION FOR THE PREVENTION OF TUBERCULOSIS TWENTY-SECOND ANNUAL CONFERENCE.

The Twenty-Second Annual Conference will be held in the Conference Hall, The County Hall, Westminster Bridge, London, S.E.1, on 16th to 18th July, 1936, under the presidency of Sir Robert Philip, M.D., LL.D., F.R.C.P. (Chairman of Council, National Association for the Prevention of Tuberculosis).

First Day, Thursday, July 16th—Morning Session, 10.30 a.m. to 1 p.m.—Inaugural Address by the Rt. Hon. Sir Kingsley Wood, M.P., Minister of Health. President's

opening remarks. Discussion: "Significance of the Examination of Contacts." To be opened by Dr. A. Salusbury MacNalty, Chief Medical Officer, Ministry of Health; and followed by Mr. Frank Kiernan, Director, New York Tuberculosis and Health Association; Dr. J. F. Bentley; Dr. Halliday Sutherland; Dr. G. Brookes Dixon. Afternoon Session, 2.30 to 5 p.m.—Discussion: "Protection of the Adolescent and Young Adult from Tuberculosis." To be opened by Dr. R. R. Trail; followed by Dr. Jane Walker, C.H.; Dr. Vere Pearson.

Second Day, Friday, July 17th—Morning Session, 10.30 a.m. to 12.30 p.m.—Discussion: "Need for closer co-operation between the Tuberculosis Service and the Maternity and Child Welfare Service, and the Educational Authorities." To be opened by Dr. W. T. Munro; followed by Baillie Stewart Reid; Dr. Letitia Fairfield, C.B.E.; Dr. George Macdonald. Afternoon Session, 2.30 to 5 p.m.—Discussion: "Tubercle-Free Herds—Present Position and Policy." To be opened by Major Rabagliati, O.B.E., C.V.O.; followed by Professor J. B. Buxton; Major Brennan De Vine, M.C., C.V.O.; Dr. L. Jordan. At 4.30 p.m. the Conference will resolve itself into the Annual Meeting of the National Association for the Prevention of Tuberculosis, to which all delegates and members are invited. Following the meeting, Tea will be served.

Third Day, Saturday, July 18th—Morning, 10.30 a.m.—Christmas Seal Sale Meeting. A meeting will be held, open to all interested persons, at which the aims and methods of the Christmas Seal Sale for Tuberculosis will be described and demonstrated. Afternoon, 2 p.m.—Visits. A visit will be arranged to Burrow Hill Sanatorium Colony, Frimley, Surrey, particulars of which will be sent to Delegates and Members of the Conference. By arrangement with the London County Council, various institutions of special interest in and near London will be open to inspection during the time of the Conference.

TUBERCULOSIS (ATTESTED HERDS) SCHEMES.—PUBLICATION OF REGISTER OF ATTESTED HERDS.

A FURTHER issue of the Register of herds attested under the above Schemes has been published jointly by the Ministry of Agriculture and Fisheries and the Department of Agriculture for Scotland. The Register has been brought up to the 31st March, 1936, on which date 81 herds in England and 88 herds in Scotland were attested, as compared with 31 and 27 respectively when the previous issue was made on 31st August last. The inclusion of a herd on this Register is evidence that the herd was, at the date of attestation, free from the infection of tuberculosis, whilst the observance of the rules of the schemes reduces the risk of the introduction of further infection to the lowest practicable point. The owner of an attested herd is entitled to claim from the Department concerned a bonus of 1*d*. per gallon in respect of milk sold from the the herd through the medium of the Milk Marketing Board. Full particulars of the Schemes and copies of the Register are obtainable from the offices of the Departments concerned in London and Edinburgh.—Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1.

REPORT OF THE DIRECTOR OF ABATTOIRS, LIVE STOCK MARKETS, VETERINARY SERVICES, ICE AND COLD STORAGE DEPARTMENT FOR 1934-1935, JOHANNESBURG.

THIS important report is always interesting, as it shows continued progress in Public Health work and the capability of veterinary supervision. Colonel J. Irvine-Smith has had a long and very successful reign in his present sphere. He has recently

received the Johannesburg Council Highest Appreciation placed on the Records of the Council, and although due to retire on the age limit has been re-appointed for another three years. The abattoir and live-stock market is conducted on a non-profit basis, and last year there was a surplus of £163 of income over expenditure, The Council has a fund which indemnifies owners of live-stock against loss of carcases in the abattoirs, the premium being 1*s.* 6*d.* for oxen and pigs, and 2*d.* for sheep. Meat inspection is carried out by government approved veterinary officers.

Chilled Beef Export to Great Britain.—There are over 10,000,000 cattle in the Union. Number of cattle killed, 3,586; number of quarters passed, 10,034. Since the live-stock market opened, 25 years ago, over 27,000,000 animals, including 5,000,000 cattle, passed through it, and no visible improvement in the quality has taken place. Johannesburg is supplied with the dearest and most inferior quality meat in the world. The Government, to encourage improvement, pays farmers a subsidy and bonus of £6 to £7 17*s.* 6*d.* for cattle exported as chilled beef from the Union. Cattle can be bought in Argentina for this sum. Grade A quarters, derived from well-bred cattle not more than four years old, and properly finished on a grain ration; subsidy, 1½*d.* per lb. Grade B quarters from grass-fed animals, age limit of animals five years, subsidy, 1*d.* per lb. The Director warns the Government to be on its guard to prevent any beef containing *Cyst. bovis* being exported, as in some areas cattle are infected.

Cold Storage.—No person can erect or use a cold storage unless it conforms to regulations and has been approved by the Minister of Agriculture.

Swine Fever.—A serious outbreak of this disease occurred and was strenuously dealt with.

Anthrax.—Eight cases reported.

Markets and Abattoirs.—Animals marketed, 1,018,522. Animals slaughtered, 586,576. Unsound food destroyed, 783 tons. Cattle affected with *Cyst. bovis*, 0.51 per cent. Pigs affected with *Cyst. cellulose*, 4.20 per cent. Sheep affected with *C.L.A.*, 1.29 per cent. Tuberculosis appears to be rare in the Union, as only three bulls, eight oxen, thirty-four cows, and two hundred and seventeen pigs were found unfit for food due to this disease.

Tick Infection.—20,816 infected cattle were reported to the Agricultural department.

Municipal Animals.—The average number of animals under veterinary care were: mules, 1,523; horses, 35; oxen, 140.

Tables.—Interesting tables are given in the report relative to examination of dairy cows; Diseases rendering meat unfit for human food; Animals attended and autopsied; the Zoological Gardens; microscopic examination of smears, etc. Altogether an interesting and valuable report.

NEW ZEALAND EMBARGO.

The New Zealand embargo against the importation of stud stock from Great Britain appears to be unwarranted, because the experience of Australia, which has not had a single case of foot-and-mouth disease pass through the quarantine, should be sufficient to justify lifting the New Zealand embargo. If New Zealand persists in maintaining the embargo she is almost certain to antagonise British buyers of her products.

WHOLE-TIME VETERINARY SURGEONS.

Mr. Savery asked the Minister of Health how many whole-time veterinary surgeons have been appointed by County and County Borough Councils during the last twelve months; and whether he is willing to recommend that such councils should, as far as

possible, utilise the services of veterinary surgeons who are practising in their districts ? Sir Kingsley Wood : " I regret that I am unable to give the information asked for in the first part of the question. As regards the second part, my hon. friend is no doubt aware that the Cattle Diseases Committee of the Economic Advisory Council recommended that local authorities should appoint whole-time veterinary officers wherever this is practicable, and I do not think, therefore, I should be justified in taking the course suggested."

OLDEST TRAVELLER RETIRES.

Our readers will be interested to read the following biographical note on an old friend of the profession, Mr. Charles Henry Huish, who now, at the age of 88, retires from travelling on the 1st July next. Born in 1848, at Ilchester, Somersetshire, he was apprenticed to a retail pharmacist at Crewkerne in 1863. Coming to London in 1868, he joined the old-established firm of wholesale druggists, Burgess, Willows & Francis, in 1868, and in the following year became a town traveller. Having held this position for about four years he then went to Mackeys of Bouverie Street, as town and country traveller, staying with them about thirteen years and leaving them to join Corbyn, Stacey & Co. (both these firms have since been absorbed by Willows, Francis, Butler & Thompson, Ltd.). After a short period with Messrs, Richardsons of Leicester, Mr. Huish rejoined Willows & Co. in 1909, with whom he is now associated. Our readers, amongst whom Mr. Huish has many old friends, will wish him the best of health with which to enjoy his well-earned rest.

Personal

The profession will read with great regret of the death of Professor James Macqueen, which occurred on the 23rd inst., after a somewhat tedious illness. His biography and services to the profession will be dealt with in our next issue.

Congratulations to Professor James Craig, M.A., M.R.C.V.S., of the William Prescott Chair of the University of Liverpool, and Professor James Douglas Stewart, B.V.Sc., M.R.C.V.S., the Dean of the Veterinary Faculty of the University of Sydney, New South Wales, on being the recipients of the Honorary Fellowship of the Royal College of Veterinary Surgeons.

H. R. Seddon, who has been Director of the Glenfield (N.S.W.) Veterinary Research Station for many years, has been appointed Professor of Veterinary Science at the Brisbane University. He will also be associated with the Stock Branch of the Queensland Department of Agriculture.

Dr. Maurice C. Hall, Chief of the Zoological Division of the Bureau of Animal Industry, has resigned his position to accept a similar post with the United States Public Health Service. He is accompanied by four members of his staff : Drs. Cram, Jones, Wright, Bozicevich. This transfer is a great loss to the Bureau of Animal Industry and a gain to the Public Health Service. Dr. Schwartz succeeds Dr. Hall, and Dr. Price succeeds Dr. Schwartz. Dr. Brandly, assistant professor of bacteriology, Kansas State College, has been appointed Pathologist in the Division of Animal Pathology and Hygiene, University of Illinois.

In our advertisement pages will be found an announcement of a poster competition in aid of a fund for the re-construction of the Children's Hospital in Great Ormond Street, and members of our profession in particular who have artistic tastes (and who are lovers of children as well as animals) will, we hope, display special interest.

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